Claims

1. Use of a compound of formula (I) or an agriculturally acceptable salt thereof for plant growth regulation

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wherein:

R¹ is CONR⁶R⁷ or CO₂R⁸:

W is C-halogen or N;

10 R^2 is H or $S(O)_m R^9$;

 \mbox{R}^{3} is $\mbox{NR}^{10}\mbox{R}^{11},$ halogen, OH, (C1-C6)-alkoxy, (C2-C6)-alkenyloxy or

(C₂-C₆)-alkynyloxy;

R⁴ is H, or halogen;

 R^5 is (C_1-C_4) -haloalkyl or (C_1-C_4) -haloalkoxy;

15 R^6 is H, (C_1-C_6) -alkyl, (C_1-C_6) -haloalkyl, (C_1-C_6) -alkoxy- (C_1-C_6) -alkyl, (C_2-C_6) -alkyl, (C_3-C_6) -alkyl, (C_4-C_6) -

C₆)-alkenyl, (C₂-C₆)-haloalkenyl, (C₂-C₆)-alkynyl, (C₂-C₆)-haloalkynyl, (C₃-

 C_7)-cycloalkyl, (C_3 - C_7)-cycloalkyl-(C_1 - C_6)-alkyl, (C_1 - C_6)-alkoxy, (C_1 -

 C_6)-alkylthio, $(CH_2)_nR^{12}$, $(CH_2)_pR^{13}$, (C_1-C_6) -alkyl-CN, (C_1-C_6) -alkyl-NR¹⁰R¹¹ or (C_1-C_6) -alkyl-S(O)_rR⁹;

 R^7 is H, (C₁-C₆)-alkyl, (C₃-C₆)-alkenyl or (C₃-C₆)-alkynyl; or

 R^6 and R^7 together with the attached N atom form a five- or six-membered saturated ring which optionally contains an additional hetero atom in the ring which is selected from O, S and N, the ring being unsubstituted or substituted by one or more radicals selected from the group consisting of halogen, (C₁-

25 C_6)-alkyl and (C_1-C_6) -haloalkyl;

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 R^8 is H, (C1-C6)-alkyl, (C1-C6)-haloalkyl, (C2-C6)-alkenyl, (C2-C6)-alkynyl or (CH2)n R^{12} ;

 R^9 is (C_1-C_6) -alkyl or (C_1-C_6) -haloalkyl;

 R^{10} and R^{11} are each independently H, (C₁-C₆)-alkyl, (C₁-C₆)-haloalkyl, (C₂-C₆)-alkenyl, (C₂-C₆)-alkynyl, (C₃-C₆)-cycloalkyl,

 (C_3-C_6) -cycloalkyl- (C_1-C_6) -alkyl, COR^{14} or CO_2R^{15} ; or

 R^{10} and R^{11} together with the attached N atom form a five- or six-membered saturated ring which optionally contains an additional hetero atom in the ring which is selected from O, S and N, the ring being unsubstituted or substituted by one or more radicals selected from the group consisting of halogen, (C₁-C₆)-alkyl and (C₁-C₆)-haloalkyl;

 R^{12} is phenyl unsubstituted or substituted by one or more radicals selected from the group consisting of halogen, (C₁-C₆)-alkyl, (C₁-C₆)-haloalkyl, (C₁-C₆)-alkoxy, (C₁-C₆)-haloalkoxy, CO₂R¹⁶, CN, NO₂, S(O)_qR⁹, COR¹⁶, CONR¹⁶R¹⁷,

NR¹⁶R¹⁷ and OH;

 C_6)-alkenyl, (C_2 - C_6)-haloalkenyl, (C_2 - C_6)-alkynyl or (C_1 - C_6)-alkoxy-(C_1 - C_4)-alkyl;

 R^{16} and R^{17} are each independently H, (C₁-C₆)-alkyl or (C₁-C₆)-haloalkyl; m, q and r are each independently 0, 1 or 2;

n and p are each independently 0, 1, 2, 3 or 4; and

each heterocyclyl in the above-mentioned radicals is independently a heterocyclic radical having 3 to 7 ring atoms and 1, 2 or 3 heteroatoms in the ring selected from the group consisting of N, O and S.

The use of a compound as defined in claim 1, in which in which
 R¹ is CONR⁶R⁷;
 W is C-Cl or C-Br
 R² is S(O)_mR⁹;

 R^3 is $NR^{10}R^{11}$, halogen, OH, (C_1-C_3) -alkoxy, (C_2-C_6) -alkenyloxy or (C_2-C_6) -alkynyloxy;

R⁴ is Cl or Br;

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R⁵ is CF₃ or OCF₃;

 R^6 is H, (C_1-C_4) -alkyl, (C_1-C_4) -haloalkyl, (C_1-C_3) -alkoxy- (C_1-C_3) -alkyl, (C_3-C_4) -alkenyl, (C_3-C_4) -haloalkenyl, (C_3-C_4) -alkynyl, (C_3-C_4) -haloalkynyl, (C_3-C_4) -alkyl, (C_3-C_4) -alkyl, (C_3-C_4) -alkyl, (C_3-C_4) -alkyl, (C_3-C_4) -alkyl, (C_3-C_4) -alkylthio, (C_3-C_4) -alkylthio, (C_3-C_4) -alkyl, (C_3-C_4) -alkylthio, (C_3-C_4) -alkylthio,

 R^7 is H, (C₁-C₄)-alkyl, (C₃-C₄)-alkenyl or (C₃-C₄)-alkynyl; or

preferably R⁶ and R⁷ together with the attached N atom form a five- or sixmembered saturated ring which optionally contains an additional hetero atom in the ring which is selected from O, S and N, the ring being unsubstituted or substituted by one or more radicals selected from the group consisting of halogen, (C₁-C₃)-alkyl and (C₁-C₃)-haloalkyl;

15 R^9 is (C_1-C_3) -alkyl or (C_1-C_3) -haloalkyl (more preferably R^9 is CF_3); R^{10} and R^{11} are each independently H, (C_1-C_3) -alkyl, (C_1-C_3) -haloalkyl, (C_3-C_4) -alkenyl, (C_3-C_4) -haloalkenyl, (C_3-C_4) -alkynyl, (C_3-C_6) -cycloalkyl, (C_3-C_6) -cycloalkyl- (C_1-C_3) -alkyl, COR^{14} or CO_2R^{15} ; or

 R^{10} and R^{11} together with the attached N atom form a five- or six-membered saturated ring which optionally contains an additional hetero atom in the ring which is selected from O, S and N, the ring being unsubstituted or substituted by one or more radicals selected from the group consisting of halogen, (C₁-C₃)-alkyl and (C₁-C₃)-haloalkyl;

 R^{12} is phenyl unsubstituted or substituted by one or more radicals selected from the group consisting of halogen, (C₁-C₃)-alkyl, (C₁-C₃)-haloalkyl, (C₁-C₃)-alkoxy, (C₁-C₃)-haloalkoxy, CO₂R¹⁶, CN, NO₂, S(O)_qR⁹, COR¹⁶, CONR¹⁶R¹⁷, NR¹⁶R¹⁷ and OH;

 R^{13} is heterocyclyl unsubstituted or substituted by one or more radicals selected from the group consisting of halogen, (C₁-C₃)-alkyl, (C₁-C₃)-haloalkyl, (C₁-C₃)-alkoxy, (C₁-C₃)-haloalkoxy, NO₂, CN, CO₂R¹⁶, S(O)_qR⁹, OH and oxo;

 R^{14} and R^{15} are each independently H, (C₁-C₃)-alkyl, (C₁-C₃)-haloalkyl, (C₂-C₃)-alkenyl, (C₂-C₃)-alkynyl or (C₁-C₆)-alkoxy-(C₁-C₄)-alkyl;

R¹⁶ and R¹⁷ are each independently H, (C₁-C₃)-alkyl or (C₁-C₃)-haloalkyl; and each heterocyclyl in the above-mentioned radicals is independently a heterocyclic radical having 3 to 6 ring atoms and 1, 2 or 3 hetero atoms in the ring selected from the group consisting of N, O and S.

3. The use of a compound as defined in claim1, in which

10 R^1 is $CONR^6R^7$;

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W is C-CI;

 R^2 is H, or $S(O)_m R^9$;

R³ is NR¹⁰R¹¹, halogen, OH or (C₁-C₃)-alkoxy;

R⁴ is CI:

15 R^5 is CF_3 ;

$$\begin{split} &R^6 \text{ is H, } (C_1\text{-}C_4)\text{-alkyl, } (C_1\text{-}C_3)\text{-alkoxy-}(C_1\text{-}C_2)\text{-alkyl, } (C_3\text{-}C_4)\text{-alkenyl, } (C_3\text{-}C_4)\text{-alkynyl, } (C_3\text{-}C_6)\text{-cycloalkyl-}(C_1\text{-}C_2)\text{-alkyl, } (C_1\text{-}C_3)\text{-alkoxy, } (C_1\text{-}C_3)\text{-alkylthio, } (CH_2)_nR^{12} \text{ or } (CH_2)_pR^{13}; \end{split}$$

 R^7 is H, (C_1-C_3) -alkyl, (C_3-C_4) -alkenyl or (C_3-C_4) -alkynyl;

20 R⁹ is methyl, ethyl or CF₃;

 R^{10} and R^{11} are each independently H, (C_1-C_3) -alkyl, (C_1-C_3) -haloalkyl, (C_3-C_4) -alkenyl, (C_3-C_4) -alkynyl, (C_3-C_6) -cycloalkyl, (C_3-C_6) -cycloalkyl, (C_3-C_6) -cycloalkyl- (C_1-C_3) -alkyl, COR^{14} or CO_2R^{15} ; or

R¹² is phenyl unsubstituted or substituted by one or more radicals selected from the group consisting of halogen, (C₁-C₃)-alkyl, (C₁-C₃)-haloalkyl, (C₁-C₃)-alkoxy, CO₂R¹⁶, CN and NO₂;

 R^{13} is heterocyclyl unsubstituted or substituted by one or more radicals selected from the group consisting of halogen, (C₁-C₃)-alkyl, (C₁-C₃)-haloalkyl, (C₁-C₃)-alkoxy, (C₁-C₃)-haloalkoxy, NO₂, CN, CO₂R¹⁶, S(O)_qR⁹, OH and oxo;

30 R¹⁴ and R¹⁵ are each independently (C₁-C₃)-alkyl;

R¹⁶ and R¹⁷ are each independently H or (C₁-C₃)-alkyl; and

each heterocyclyl in the above-mentioned radicals is independently a heterocyclic radical having 3 to 6 ring atoms and 1, 2 or 3 hetero atoms in the ring selected from the group consisting of N, O and S.

5 4. The use of a compound as defined in claim 1, in which R¹ is CONR⁶R⁷; W is C-Cl;

 R^2 is H, or $S(O)_m R^9$;

R³ is NHR¹⁰;

10 R^4 is CI;

R⁵ is CF₃;

 R^6 is H, (C₁-C₅)-alkyl, (C₁-C₂)-alkoxy-(C₁-C₂)-alkyl, (C₃-C₄)-alkenyl, (C₃-C₄)-alkynyl, (C₃-C₆)-cycloalkyl, (C₃-C₆)-cycloalkyl-(C₁-C₂)-alkyl, furfuryl or tetrahydrofurfuryl;

15 R^7 is H or (C_1-C_3) -alkyl; R^9 is methyl, ethyl or CF_3 ; and R^{10} is H, methyl or ethyl.

5. The use of a compound as defined in claim 1, in which

 R^1 is CO_2R^8 ;

W is C-CI:

 R^2 is H, or $S(O)_m R^9$;

R³ is NR¹⁰R¹¹;

R⁴ is CI:

 R^5 is CF_3 ;

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R⁸ is H, methyl or ethyl;

R⁹ is methyl, ethyl or CF₃;

R¹⁰ is H, methyl or ethyl; and

R¹¹ is H.

6. The use of a compound as defined in claim 1, in which R¹ is CONR⁶R⁷;

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W is C-CI:
                       R^2 is S(O)_mCF_3;
                      R<sup>3</sup> is NR<sup>10</sup>R<sup>11</sup>, halogen, OH or (C<sub>1</sub>-C<sub>2</sub>)-alkyl;
                      R<sup>4</sup> is Cl:
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                      R<sup>5</sup> is CF<sub>3</sub>:
                      R^6 is H or (C_1-C_3)-alkylthio:
                      R<sup>7</sup> is H:
                      R^{10} is (C<sub>1</sub>-C<sub>3</sub>)-alkyl, COR<sup>14</sup> or CO<sub>2</sub>R<sup>15</sup>:
                      R<sup>11</sup>, R<sup>14</sup> and R<sup>15</sup> are each independently (C<sub>1</sub>-C<sub>3</sub>)-alkyl.
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7. A composition for plant growth regulation, which comprises one or more compounds of formula (I) as defined in anyone of claims 1 to 6 or an agriculturally acceptable salt thereof, carriers and/or surfactants useful for plant protection formulations.

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The composition as claimed in claim 7, which comprises a further active 8. compound selected from the group consisting of acaricides, fungicides, herbicides, insecticides, nematicides or plant growth regulating substances not identical to compounds defined by formula (I) of claim 1.

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The use of a composition as claimed in anyone of claims 7 to 8 for plant 9. growth regulation, in which the plant is a monocotyledoneous or dicotyledoneous crop plant.

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The use as claimed in claim 9, wherein the plant is selected from the group 10. consisting of wheat, barley, rye, triticale, rice, maize, sugar beet, cotton, or soybeans.

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A method for growth regulation in field crop plants, which comprises applying 11. an effective amount of a compound of formula (I) as defined in claims 1 to 6 to the site where the action is desired said method comprising applying to plants, to seeds from which they grow or to the locus in which they grow, a nonphytotoxic, effective plant growth regulating amount of one or more compounds of formula (I).

- 12. A method as claimed in claim 11 that results into a yield increase of at least10% concerning the plants to which it is applied.
 - 13. A compound as defined by formula (I), or a salt thereof,

$$R^2$$
 R^3
 N
 N
 R^4
 W
 R^5
 (I)

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wherein:

i. R^1 is CO_2R^8 ;

 R^2 is H or $S(O)_m R^9$;

R³, R⁴, R⁵, W and m are as defined in claim 1;

R⁸ is H; and

 R^9 is (C_2-C_6) -alkyl or (C_1-C_6) -haloalkyl;

or

20 ii. R^1 is $CONR^6R^7$;

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R⁶ and R⁷ together with the attached N atom form a five- or six-membered saturated ring which optionally contains an additional hetero atom in the ring which is selected from O, S and N, the ring being unsubstituted or substituted by one or more radicals selected from the group consisting of halogen, (C₁-C₆)-alkyl and (C₁-C₆)-haloalkyl; and R², R³, R⁴, R⁵, R⁷, R⁹, R¹⁰, R¹¹, R¹², R¹³, W, n, p and r are as defined in formula (I);

with the exclusion of the compound wherein:

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 R^1 is $CON(CH_3)_2$; R^2 is CF_3S ; R^3 is OH; R^4 is CI; R^5 is CF_3 ; and W is C-CI.